MITES FOUND ON MICE OF THE GENUS PEROMYSCUS IN UTAH. IV. FAMILIES LAELAPTIDAE AND PHYTOSEIIDAE[1]

(Acarina)

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In three previous papers (Allred, 1956a, 1956b, and unpublished manuscript), the author discussed the general mite infestation of five species of white-footed mice in Utah, *Peromyscus boylii, P. crinitus, P. eremicus, P. maniculatus*, and *P. truei*, and the species of mites of the families Haemogamasidae and Dermanyssidae found on these mice over a five-year period. This paper is a continuation of the results of that study.

LAELAPTIDAE

EUBRACHYLAELAPS CIRCULARIS (Ewing), 1933

(Plate II, Figs. 36, 40, 41, 45, 47, 49; Plate VI)

Ewing (1933) described *E. circularis* from two females taken from two specimens of *Peromyscus truei* collected at Salina, Sevier County, Utah, by J. S. Stanford in November and December, 1928. When compared with Ewing's description of the type and with notes by Jameson (1950, 1951), mites that were collected recently in Utah differ very little.

This species occurs frequently on mice of several species of *Peromyscus*. Jameson (1950) listed *P. truei, P. boylii*, and *P. hylocetes* as known hosts. In addition to the type locality of this species in Utah, Keegan (1953) has record of one female taken from *P. truei*. These mites probably are state-wide in distribution. They are known to occur in Utah at elevations from about 2250 to 6250 feet in all of the life zones from the Lower Sonoran to the Canadian. They were collected most frequently in the Upper Sonoran and Transition life zones.

A total of 392 female mites of this species was taken from 71 mice. The mites were collected every month, although those in the southern part of Utah were found only during the period from April to September. The largest numbers were collected in April, June, and July.

Mites of this species possess an ovoviviparous type of repro-

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duction. There is only one egg produced at a time. The egg is relatively large and occupies almost one-half the space of the idiosoma. It develops into a six-legged larva within the body of the female. Each of 236 gravid females that was collected contained one egg or larva. Gravid mites were found every month except October and December. Apparently mites of this species reproduce throughout the year in Utah.

In 22 collections of mice that were infested by *E. circularis*, this was the only mite found on its host. In the remaining collections, this species was associated with the following species the numbers of times indicated: *Haemolaelaps glasgowi*, 19; *H. megaventralis*, 1; *Eubrachylaelaps debilis*, 3; *Bryobia praetensis*, 1; *Euschongastia criceticola*, 1; *Ischyropoda armatus*, 1; *Ornithonyssus bacoti*, 3; *Dermanyssus becki*, 1; *Hirstionyssus* sp., 5; *Ornithonyssus* sp., 1; *Listrophorus* sp., 1; *Hermannia* sp., 1; *Euhaemogamasus* sp., 1; Trombiculinae sp., 1; Laelaptidae sp., 1; Trombidiidae sp., 1.

Table 1.—Species and percentages of mice infested by mites of the species *Eubrachylaelaps circularis*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. boylii	37	0.5	145	7.4
P. crinitus	67	3.0	35	17.5
P. eremicus	201	7.0	65	4.5
P. maniculatus	2907	0.6	79	4.7
P. truei	59	50.8	68	2.3

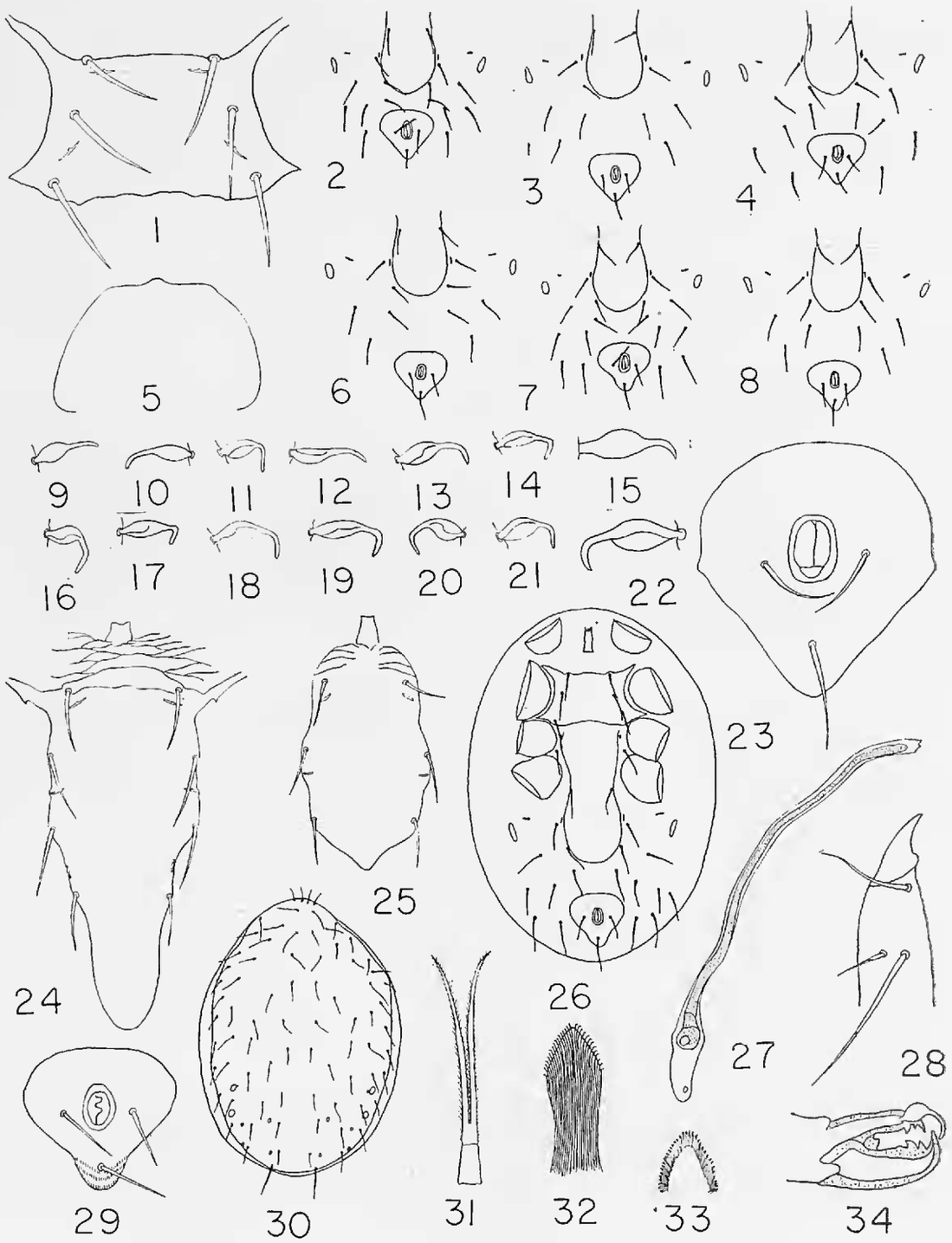
EUBRACHYLAELAPS DEBILIS Jameson, 1950

(Plate II, Figs. 37, 42, 43, 46, 48; Plate VI)

Jameson (1950) described this species from 21 females taken from *Peromyscus maniculatus* from California in February and July, 1949. Specimens taken in this study in Utah agree with the description of the type.

This species was reported from California and Oregon by Jameson (*op. cit.*). Keegan (1953) reported records from *Peromyscus maniculatus* and *P. crinitus* collected in Utah in October and November, 1951. This species is state-wide in distribution. It is known to occur at elevations between 2250 and 10,000 feet in all of the life zones from the Lower Sonoran to the Hudsonian, although it was collected most frequently in the Upper Sonoran and Transition life zones.

These mites were collected during the period from February



Explanation of Plate I

Haemolaelaps glasgowi: fig. 1, sternal plate of female; figs 2–4, 6–8, 26, arrangement of ventral setae and plates of female; fig. 5, tectum of deutonymph; figs. 9, 10, pilus dentilis of protonymph; figs. 11–16, 18–21, pilus dentilis of female; fig. 17, pilus dentilis of nymph; fig. 22, pilus dentilis of deutonymph; fig. 23, anal plate of deutonymph; fig. 24, sternal plate of deutonymph; fig. 25, sternal plate of protonymph; fig. 26, ventral view of female; fig. 27, right peritreme of female; fig. 28, ventral view of right cornicula of deutonymph; fig. 29, anal plate of female; fig. 30, dorsal plate of female; fig. 31, tritosternum of female; fig. 32, hypopharynx (labium of Strandtmann) of deutonymph; fig. 33, hypopharynx of female; fig. 34, lateral view of chelicera of female.

to October, the largest numbers being found in May and June. Those mites that were collected in western Utah south of the 38th parallel and in eastern Utah in the Colorado River Basin were found only during the period from April to July. Those north of the 38th parallel were found only during the period from February to October.

Mites of this species have an ovoviviparous type of reproduction. One mounted female was observed wherein a six-legged larva was about half-way out of the genital opening. Each of 499 females collected over a nine-month period contained one egg or larva; apparently mites of this species also produce one egg at a time.

Twenty-eight of the 111 times that it was collected, *E. debilis* was the only mite found on its host. At other times, it was associated with the following species the numbers of times indicated: *Eubrachylaelaps circularis*, 3; *E. hollisteri*, 1; *Hirstionyssus* spp., 17; *Haemolaelaps glasgowi*, 46; *H. megaventralis*, 3; *Euschongastia criceticola*, 2; *Ornithonyssus bacoti*, 3; *Shunsennia ochotona*, 1; *Radfordia lemnina*, 1; *Euhaemogamasus* spp., 7; *Dermanyssus becki*, 1; *Hypoaspis gurabensis*, 1; *Trombicula myotis*, 2; *Ischyropoda armatus*, 3; *Euladelaps* sp., 1; Phytoseiidae sp., 3; Laelaptidae sp., 3; Parasitidae sp., 3; Gamasolaelaptidae sp., 1; Ascaidae sp., 1; Eremaeidae sp., 2; Pachylaelaptidae sp., 2.

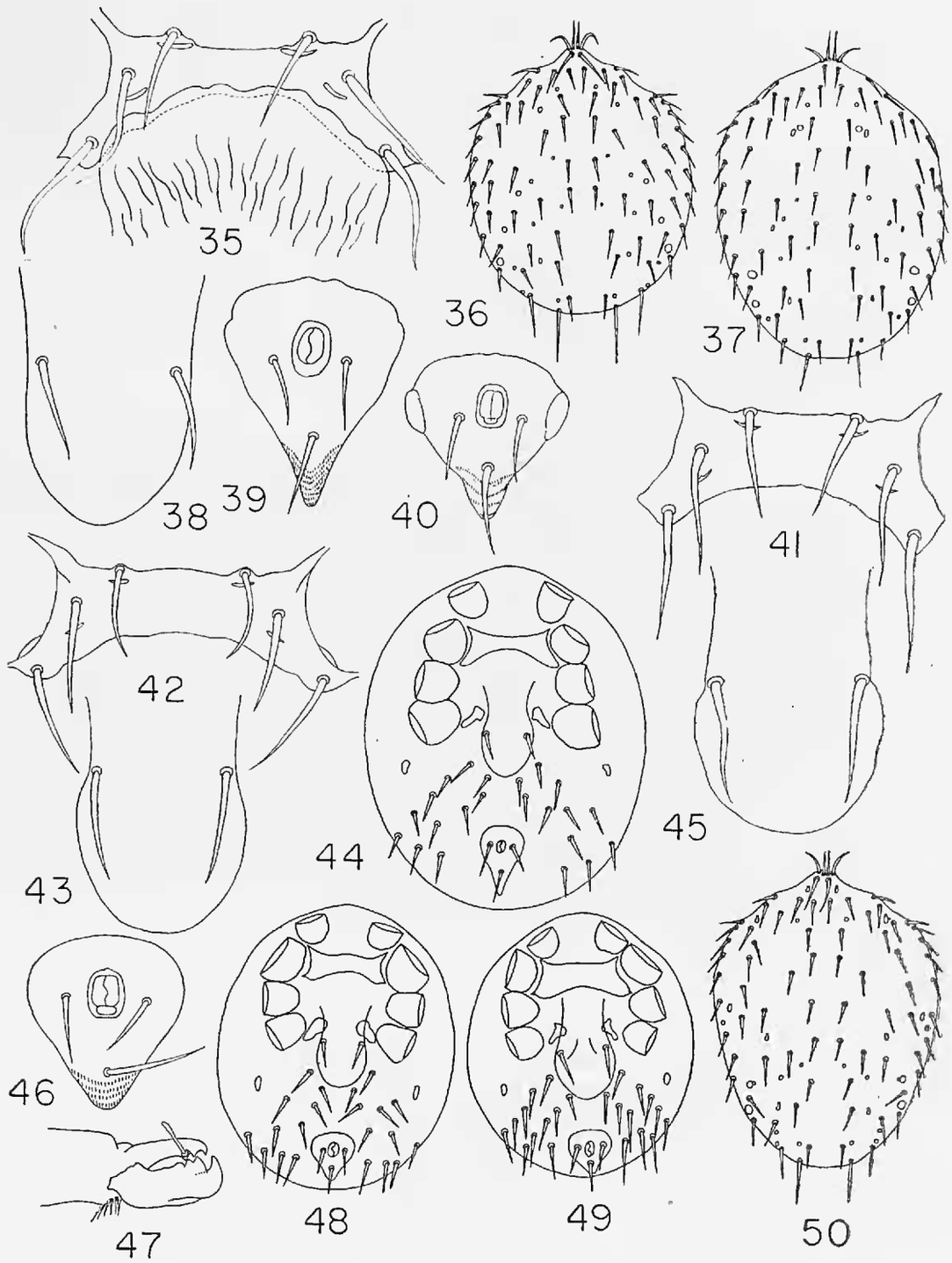
Table 2.—Species and percentages of mice infested by mites of the species *Eubrachylaelaps debilis*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. crinitus	67	1.5	2	2.0
P. eremicus	201	1.0	2	1.0
P. maniculatus	2907	3.7	623	5.8
P. truei	59	1.7	10	10.0

EUBRACHYLAELAPS HOLLISTERI (Ewing), 1925

(Plate II, Figs. 35, 38, 39, 44, 50; Plate V)

Ewing's (1925) description of *Eubrachylaelaps hollisteri* is very general and lacks illustrations. This species should be redescribed once sufficient specimens have been collected from a broader geographic range. Ewing's type specimens were taken from caged mice of the species *Peromyscus californicus* sent to the National Zoological Park at Washington, D.C., from San



Explanation of Plate II

Eubrachylaelaps hollisteri: fig. 35, sternal plate of female, showing overlap of genitoventral plate; fig. 38, genitoventral plate of female; fig. 39, anal plate of female; fig. 44, arrangement of ventral setae of female; fig. 50, dorsal plate of female. *Eubrachylaelaps circularis:* fig. 36, dorsal plate of female; fig. 40, anal plate of female; fig. 41, sternal plate of female; fig. 45, genitoventral plate of female; fig. 47, lateral view of chelicera of female; fig. 49, arrangement of ventral setae of female. *Eubrachylaelaps debilis:* fig. 37, dorsal plate of female; fig. 42, sternal plate of female; fig. 43, genitoventral plate of female; fig. 46, anal plate of female; fig. 48, arrangement of ventral setae of female.

Francisco, California. Ewing designated the latter area as the type locality.

Mites of this species collected in this study conform to the description of the type. *E. hollisteri* probably is state-wide in distribution in Utah. It has been collected most commonly in the southern part of the state at elevations between 2250 and 5750 feet, principally in the Lower and Upper Sonoran life zones.

Table 3.—Species and percentages of mice infested by mites of the species *Eubrachylaelaps hollisteri*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. crinitus	67	12.0	57	7.1
P. eremicus	201	10.4	70	3.4
P. maniculatus	2907	0.1	17	4.2
P. truei	59	3.4	3	1.5

A total of 147 female mites of this species was collected from 35 mice during the period from February to September, although only two mites were collected in February and one mite in September. No mites of this species were collected in March and August. The largest numbers were collected in April, May, and July.

Mites of this species have an ovoviviparous type of reproduction. Each of 115 gravid mites contained one egg or larva. Every month that this species was collected, gravid mites were present.

Twenty-five of the 35 times that it was collected, *E. hollisteri* was the only mite found on its host. At other times, it was associated with the following species the numbers of times indicated: *Trombicula belkini*, 1; *Ornithonyssus bacoti*, 1; *Brevisterna utahensis*, 2; *Hirstionyssus* spp., 3; *Eubrachylaelaps debilis*, 1; *Haemolaelaps glasgowi*, 2; *Dermanyssus becki*, 2; *Euhaemogamasus* sp., 1.

Haemolaelaps glasgowi (Ewing), 1925

(Plate I, Figs. 1–34; Plate IV)

Ewing (1925) described *H. glasgowi* from a single female specimen collected from a "wild rat" at Urbana, Illinois in 1912. Strandtmann (1949) discussed the synonymy, morphology and variations of this and related species of *Haemolaelaps*. Specimens

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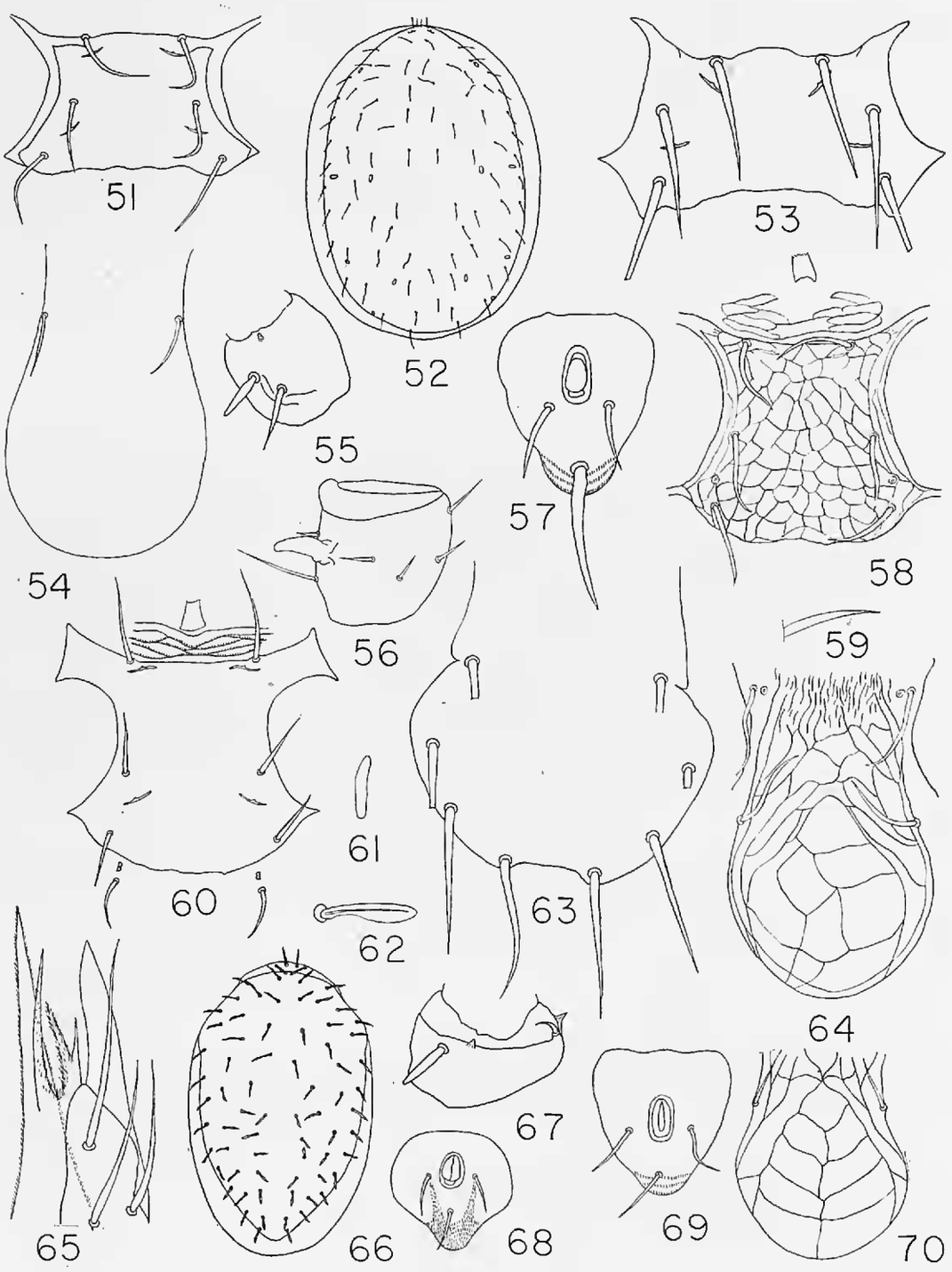
Explanation of Plate III

Haemolaelaps megaventralis: fig. 51, sternal plate of female; fig. 52,



dorsal plate of female; fig. 54, genitoventral plate of female; fig. 59, pilus dentilis of female; fig. 61, metapodal plate of female; fig. 69, anal plate of female. *Laelaps nuttalli:* fig. 53, sternal plate of female; fig. 55, ventral view of right coxa I of female; fig. 57, anal plate of female; fig. 63, genitoventral plate of female; fig. 67, ventral view of right coxa II of female. *Hypoaspis leviculus:* fig. 56, ventral view of right femur II of female; fig. 58, reticulation of sternal plate of female; fig. 64, gentioventral plate of female, showing reticulation, metasternal setae and pores. *Hypoaspis gurabensis:* fig. 60, sternal plate of female; fig. 62, dorsal seta of female; fig. 65, ventral view of left half of gnathosoma of female; fig. 66, dorsal plate of female; fig. 68, anal plate of female; fig. 70, reticulation of genitoventral plate of female.

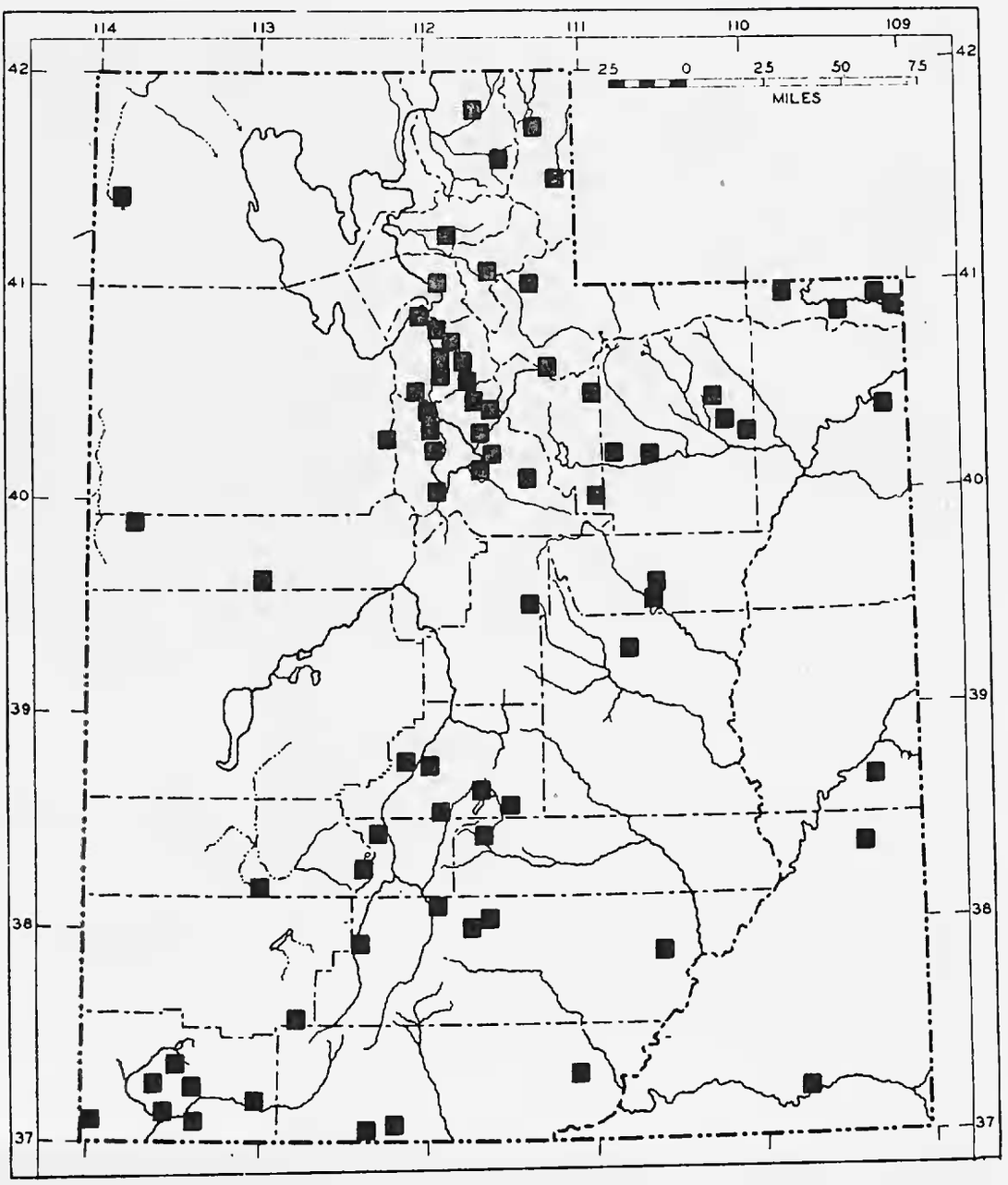
of this species from Utah collected in this study show some variations in the distance between the anal and genitoventral plates, and the amount of inflation and recurvation of the pilus dentilis. In Strandtmann's (*op. cit.*) key to the species of *Haemolaelaps*, he separated *H. glasgowi* and *H. geomys* partly on the basis of the amount of curvature of the slender terminal portion of the pilus dentilis. Mites collected in this study vary considerably with reference to the amount of curvature of this structure. Because of its variability, it appears that the pilus dentilis should be used primarily to separate the species into major groups rather than to separate two distinct species. In some specimens from Utah, the distance betwen the anal and genitoventral plates approaches that which is distinctive of specimens of *H. megaventralis*. A considerable range of variation in the distance between these ventral plates occurs in *H. glasgowi*. Strandtmann (*op. cit.*) stated that there are certain intraspecific differences which are apparent when comparing specimens from one host with those of another. These differences also occur between specimens from the same animal host, especially where large numbers of mites are concerned.

Mites of this species apparently have a preference for the Rodentia, although *H. glasgowi* has been taken from a variety of habitats and hosts including birds. It is known to occur principally in the western hemisphere and has been reported from almost all of the United States. Keegan (1953) reported that mites of this species occur on animals of the following species in Utah: *Citellus leucurus, Eutamias minimus, Onychomys leucogaster, Reithrodontomys megalotis, Peromyscus crinitus, P. maniculatus, Dipodomys ordii*, and *D. microps*. This species of mite is statewide in distribution in Utah at elevations between 2250 and 10,000 feet in all of the life zones from the Lower Sonoran to the Hudsonian. It has been collected most frequently in the Lower Sonoran and Transition life zones.

Haemolaelaps glasgowi was the species collected most frequently during this study. A total of 1253 mites representing 1080 females, 79 males and 94 nymphs was collected from 316 mice. According to Strandtmann (*op. cit.*), mites of this species may be recovered during any season that the host can be captured. In this study, mites were collected every month. There were twice as many found in June than in any other month. The largest numbers

were collected during the period from April to August, and there was a conspicuous decline in the numbers of mites taken in September. During the winter, early spring, and autumn months, the numbers of mites collected were sufficiently low to be indicative of a seasonal fluctuation.

These mites have an ovoviviparous type of reproduction, and give birth to the first nymphal form (Strandtmann, *op. cit.*). Only one egg develops and matures at a time, and the larval stage is passed within the body of the female. Each of 252 gravid females found in this study contained only one egg, larva or nymph. Each



EXPLANATION OF PLATE IV

Collection localities of *Haemolaelaps glasgowi* in Utah.

egg was of a large size and occupied almost one-half the idiosoma. Many females were engorged with blood, and some of these engorged specimens were gravid. Gravid females were collected every month except November and December. Mites of this species probably reproduce throughout the year in Utah.

Male mites were collected every month except May and September; they were most abundant in April. Nymphs were collected every month except January, August and September; largest numbers were found in June and July.

Table 4.—Species and percentages of mice infested by mites of the species *Haemolaelaps glasgowi*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. boylii	37	21.6	48	6.0
P. crinitus	67	1.5	1	1.0
P. eremicus	201	8.4	36	2.1
P. maniculatus	2907	9.7	1158	4.1
P. truei	59	13.5	10	1.3

Mites of this species were associated with other mites belonging to more than 40 species. There were fluctuations in the numbers of mites that were associated with *H. glasgowi* during the five years that collections were made. There were also variations in the numbers of kinds of mites associated with this species.

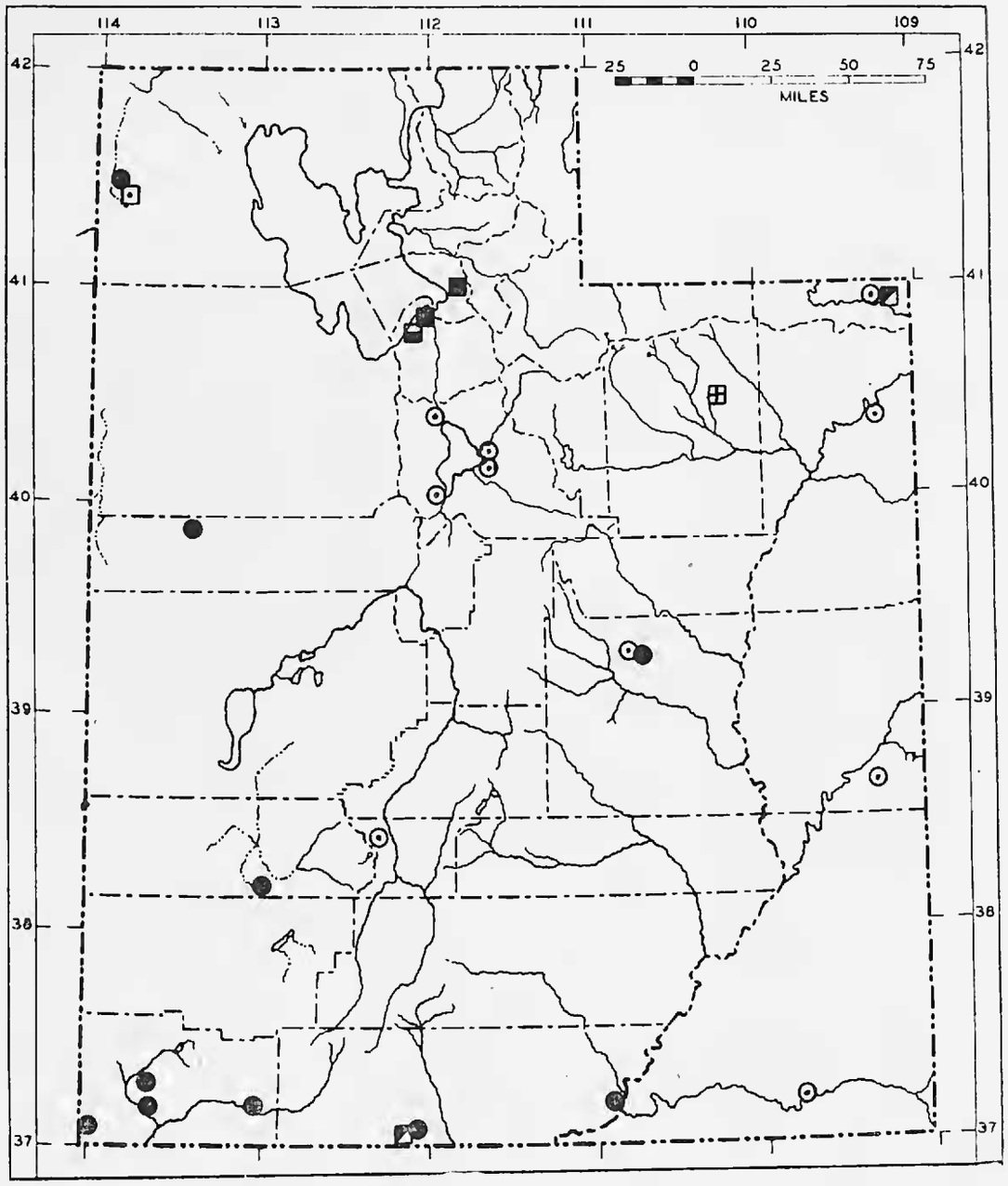
HAEMOLAELAPS MEGAVENTRALIS (Strandtmann), 1947

(Plate III, Figs. 51, 52, 54, 59, 61, 69; Plate V)

Strandtmann (1947) described this species from specimens collected from a gray squirrel from Georgia. The mites collected in this study agree in most morphological respects with the description of the type. Strandtmann (1947, 1949) stated that mites of this species have a slight preference for squirrels and birds, although they have been taken from a variety of mammals. *Haemolaelaps megaventralis* has been reported from several countries of both the northern and southern hemispheres. In North America, records are known from eastern and western United States, Mexico, and Canada. In Utah, this species probably is state-wide in distribution. It has been collected at elevations between 4000 and 5750 feet in the Upper Sonoran Life zone.

Table 5.—Species and percentages of mice infested by mites of the species *Haemolaelaps megaventralis*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. maniculatus	2907	0.3	11	1.4
P. truei	59	15.0	14	1.5



Explanation of Plate V

Collection localities of *Eubrachylaelaps hollisteri, Haemolaelaps megaventralis, Hypoaspis gurabensis, H. leviculus, Laelaps multispinosus, L. nuttali,* and *Typhlodromus mariposus* in Utah.

Thirteen nymphs, one male, and 11 females were collected from 17 mice in April, May, June, and November. Four of the 23 times that it was collected, *H. megaventralis* was the only mite found infesting its host. At other times, it was associated with the following species the numbers of times indicated: *Eubrachylaelaps debilis*, 3; *Haemolaelaps glasgowi*, 4; *Ischyropoda armatus*, 1; *Euhaemogamasus ambulans*, 1; *Hirstionyssus* sp., 4; *Garmania* sp., 2; *Hypoaspis* sp., 1; *Eulaelaps* sp., 1; *Rhizoglyphus echinopus*, 1; *Glycyphagus* sp., 1; Neoparasitidae sp., 1; Cunaxidae sp., 1.

Hypoaspis gurabensis (Fox), 1946

(Plate III, Figs. 60, 62, 65, 66, 68, 70; Plate V)

Fox (1946) described *H. gurabensis* from a single female collected from a "domestic rat or mouse" from Puerto Rico. The mites collected in this study in Utah conform to the description of the type. This species probably is statewide in distribution, but was not commonly found on mice of the genus *Peromyscus*. Mites were found at elevations between 5000 and 5500 feet in the Upper Sonoran life zone.

Fox (*op. cit.*) suggested that mites of this species probably are parasites or associates of ants. If this is true, it is probable that the infestations of mice in this study were accidental and occurred from the scavenger ants that visited the carcasses of trapped mice. Four females of this species were collected in May and June.

Hypoaspis leviculus (Eads), 1951

(Plate III, Figs. 56, 58, 64; Plate V)

Mites of this species collected in this study vary only slightly from the description of the type. Eads (1951) described the type specimen as having one large pair and one small pair of metapodal plates. Mites collected in this study have one large pair and three or four small pairs. The peritremes of the type specimens extend beyond coxae I; in the mites from Utah the peritremes end at the anterior fourth of coxae I.

The type specimens were collected in Texas from pocket mice, *Perognathus hispidus*, grasshopper mice, *Onychomys leucogaster*, and cotton rats, *Sigmodon hispidus*. Eads, *et al* (1952) reported additional collections from grasshopper mice from Texas. Keegan (1953) recorded this species from *Perognathus parvus*, *Peromyscus maniculatus*, *P. crinitus*, and *O. leucogaster* from Utah. In

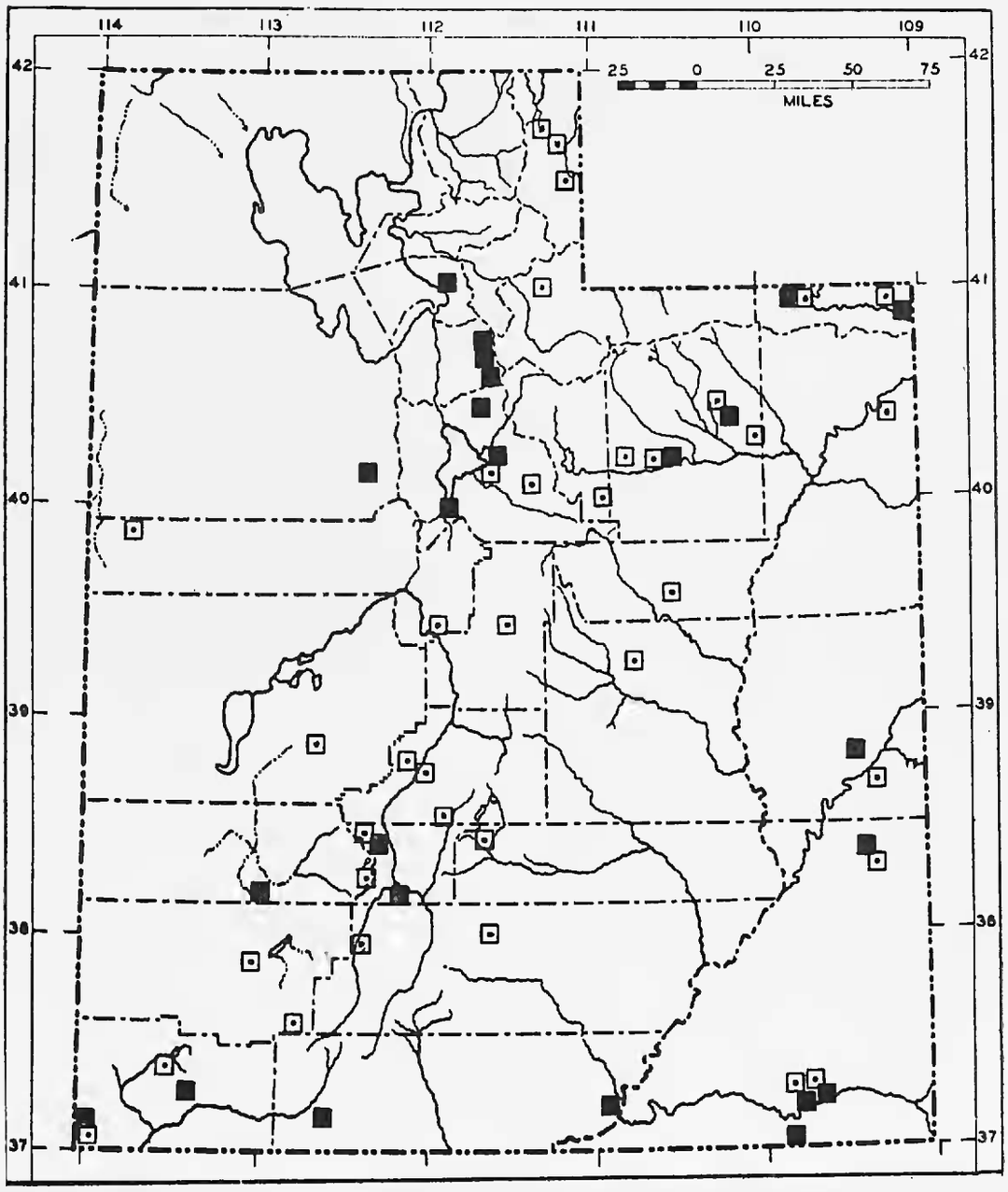
this study, two females were collected in October at an elevation of about 4500 feet in the Upper Sonoran life zone.

LAELAPS MULTISPINOSUS Banks, 1909

(Plate V)

Banks (1909) described this species from specimens taken from a muskrat from Canada. The single female collected in this study conforms to the description of the type.

According to Tipton (unpublished manuscript), mites of this genus parasitize animals that dwell in water or marshy habitats. Animals of other kinds possibly are accidentally infested by these



EXPLANATION OF PLATE VI

Collection localities of *Eubrachylaelaps debilis* and *E. circularis* in Utah.

mites when they wander into marshy habitats. The female mite in this study was collected from a mouse taken from a marshy area west of Salt Lake City, Salt Lake County, in October.

LAELAPS NUTTALLI Hirst, 1915

(Plate III, Figs. 53, 55, 57, 63, 67; Plate V)

One female mite of this species was collected in March from a mouse from Bluebell, Duchesne County, at an elevation of about 6500 feet in the Upper Sonoran life zone. Other species associated with *L. nuttalli* are *Hirstionyssus occidenalis* and *Euschongastia criceticola.*

Table 6.—Checklist and host correlation of the numbers and kinds of mites of the families Laelaptidae and Phytoseiidae taken from each of five species of *Peromyscus*.

	No. Mites Taken From Each Species Of *Peromyscus*				
Species of Mite	*P. boylii*	*P. crinitus*	*P. eremicus*	*P. maniculatus*	*P. truei*
Eubrachylaelaps circularis	145	35	65	79	68
Eubrachylaelaps debilis		2	2	623	10
Eubrachylaelaps hollisteri		57	70	17	3
Haemolaelaps glasgowi	48	1	36	1158	10
Haemolaelaps megaventralis				11	14
Hypoaspis gurabensis				4	
Hypoaspis leviculus				2	
Laelaps multispinosus				1	
Laelaps nuttalli				1	
Typhlodromus mariposus				17	

PHYTOSEIIDAE

TYPHLODROMUS MARIPOSUS (Fox), 1946

(Plate V)

Fox (1946) described this species from two females collected from "*Rattus* species or *Mus m. musculus*" and from rats, *R. norvegicus*, from Puerto Rico. Thurman and Branch (1948) re-

ported this species from *R. norvegicus* from Florida. In this study, 17 female mites were collected in September, October, and November.

Discussion

In Utah, mites of several species most commonly occur in certain faunal areas. *Eubrachylaelaps hollisteri* and *Haemolaelaps megaventralis* are generally southern in distribution. *Eubrachylaelaps hollisteri* apparently has extended its range into Utah from the south by way of the Virgin River and Colorado River drainages, and the valleys of eastern Nevada in the Great Basin area. *Haemolaelaps megaventralis* apparently has extended its range northward into Utah by way of the Colorado River drainage.

Mites of certain species, although not host specific, are associated more frequently with one kind of white-footed mouse than with another. Mites of the species *H. megaventralis* and *E. circularis* were found most frequently on *Peromyscus truei*, and *E. hollisteri* on *P. crinitus*. Such a frequent association allows a mite species to rapidly extend its range to correspond to the range of its preferred host, as long as climatic conditions are favorable for the survival of the mites. Mites of the species *H. megaventralis* were found almost exclusively in those areas which correspond to the known distribution of mice of the species *P. truei*. Mites of the species *E. hollisteri* apparently are also restricted to the range of their preferred *Peromyscus* hosts, yet mites referrable to *E. circularis* are not restricted to the range of their "preferred" host, *P. truei*. Mites of the species *E. debilis* and *H. glasgowi* were not found in a majority on any one kind of mouse, and were widely distributed over the entire area of the state.

Mites are influenced in their activity and reproductive periods by climatic conditions. In the Upper Sonoran and Transition life zones in Utah, *H. megaventralis*, *E. circularis*, and *E. debilis* were found on mice most frequently during the period from May to September. In the Lower Sonoran zone and similar areas, *E. hollisteri* was most abundant on mice during the period from May to July.

Haemolaelaps glasgowi occurs on mice of the genus *Peromyscus* in Utah more frequently and in larger numbers than mites of any other species. Next in frequency of occurrence are mites of the three species of *Eubrachylaelaps*: *E. circularis*, *E. debilis*, and

E. hollisteri. Hirstionyssus occidentalis also is commonly found on *Peromyscus* (Allred, unpublished manuscript).

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